編號： 164

國立成功大學 105 學年度碩士班招生考試試題

系　　所：生物醫學工程學系

考試科目：電子學

考試日期：0227，節次：1

※ 考生請注意：本試題不可使用計算機。　請於答案卷(卡)作答，於本試題紙上作答者，不予計分。

1. Design a two-diode circuit for (1) OR-gate (8%) and (2) AND-gate (8%)
2. Regarding an operational amplifier (op-amp):
   (1) What are the properties of an ideal op-amp? List at least three. (5%)
   (2) What are the differences between an ideal op-amp and an actual op-amp? (5%)
   (3) Name at least one advantage and one disadvantage for using BJT to implement the op-amp, rather than MOSFET. (5%)
   (4) Why are emitter followers often used in op-amp IC, such as a 741 op-amp? (5%)
3. You are asked to design an amplifier circuit to amplify a certain physiological (生理) signal measured from the human body. What are the factors to consider for such amplifier design? Name at least three factors and discuss how those factors will affect the circuit design. (20%)
4. For the circuit in Figure 1 below:
   (1) Draw the small-signal equivalent circuit. (5%)
   (2) Under what condition can the capacitor be regarded as short circuit? (5%)
   (3) By assuming that the capacitor can be regarded as short circuit and the BJT is biased in the forward active mode, derive the expression of the small-signal voltage gain $A_v=v_O/v_i$. (5%)
   (4) If the capacitor is not regarded as short circuit, determine the expression of the corner frequency of this circuit. (5%)
   (5) Following (4), draw the Bode-plot of the $|A_v|$ (5%)
5. Derive the expression of the output voltage v_O as a function of v_{I2}-v_{I1} for the circuit in Fig.2. R_v is a variable resistor. (19%)

Figure 1.

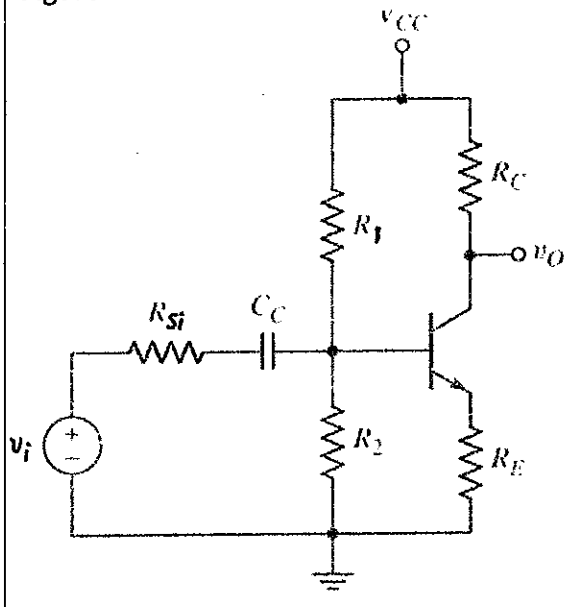

Figure 2.